



Public Safety

A Dividend in Food Safety

Among technology transfers that contribute to enhanced public safety is a broadly-used space-derived food processing control system

In 1959, NASA started planning for manned space missions. Along with the myriad difficulties of developing complex systems to sustain life in space, NASA faced a seemingly mundane but vitally important problem: How and what do you feed an astronaut in a sealed capsule under weightless conditions?



Above and at right center are examples of food and drink products carried aboard spacecraft on early manned missions. Measures developed by The Pillsbury Company to assure astronaut protection from food poisoning evolved into a comprehensive food safety system used by Pillsbury and other manufacturers.

producing bacteria and toxins. To help solve these problems, NASA enlisted the aid of one of the nation's foremost food producers, The Pillsbury Company, Minneapolis, Minnesota. Over the following decade, Pillsbury designed some of the first space foods and produced astronaut meals for the Mercury, Gemini and Apollo manned space flight programs. (Pillsbury was acquired in 1988 by the United Kingdom-based Grand Metropolitan PLC.)

Pillsbury solved one of the two major concerns in short order by developing bite-size foods coated with a material that would prevent the product from crumbling. The other part of the problem did not succumb as easily. Dr. Howard E. Bauman, now a food industry consultant in St. Louis Park, Minnesota and formerly a Pillsbury executive who worked on



the initial space food program, states that the most difficult part of the program was "to come as close as possible to 100 percent assurance that the food products we were producing for space use would not be contaminated by pathogens, bacterial or viral, that could cause an illness that might result in a catastrophic mission."

"We quickly found," he adds, "by using standard methods of quality control there was absolutely no way we could be assured there wouldn't be a problem. This brought into serious question the then prevailing system of quality control in our plants....If we had to do a great deal of destructive testing to come to a reasonable



conclusion that the product was safe to eat, how much were we missing in the way of safety issues by principally testing only the end product and raw materials?

"We concluded after extensive evaluation that the only way we could succeed would be to establish control over the entire process, the raw materials, the processing environment and the people involved."

Using that approach, Pillsbury developed the Hazard Analysis and Critical Control Point (HACCP) concept, potentially one of the most far-reaching space spinoffs. HACCP is designed to prevent food safety problems rather than to catch them after they have occurred. It is essentially a two-part concept. The Hazard Analysis portion involves a systematic study of the ingredients, the product, the conditions of processing, handling, storage, packaging, distribution and consumer use directions to identify sensitive areas that might contribute a hazard. Hazard Analysis provides a basis for blueprinting the Critical Control Points to be monitored (a Critical Control Point is any point in the chain from raw materials to finished product where loss of control could result in an unacceptable food safety risk).

A significant feature of the HACCP concept is that food production is regarded as an interlocking system, not only a farm or a processing plant or a supermarket or a consumer, but all of those, along with the distribution elements of the system.

Each link in the chain is analyzed and controlled individually, but for satisfactory results each link is dependent upon the links preceding it and following it. Unexpected or unknown safety problems with raw materials, unrecognized or uncontrolled abuse in the distribution system, careless or otherwise improper handling by the consumer — these and other matters that can create food safety problems must be identified in the Hazard Analysis phase and addressed by appropriate monitoring of Critical Control Points.

With this system, food producers can control any area in the food system that could

contribute to hazards, whether it involves contaminants, bacteria, physical objects, chemicals, raw materials, a process, consumer use directions or storage conditions.

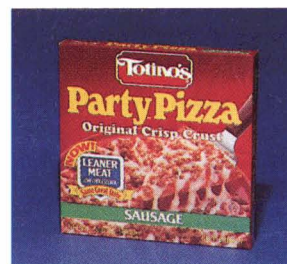
The Pillsbury-manufactured food that went to the Moon aboard Apollo spacecraft was produced under the HACCP system. Within two years of the initial lunar landing in 1969, Pillsbury plants were producing food for regular consumers following the same food safety control system. Later, Pillsbury taught a course in HACCP for personnel of the Food and Drug Administration (FDA). In the mid-1970s, FDA published the Low Acid Canned Foods Regulations, which employ the HACCP concept to ensure safety of all canned foods in the U.S.

In 1985, HACCP was recommended by the National Academy of Sciences as the method of choice for preventing microbiological food safety problems. In 1988, it was further recommended by the National Advisory Committee on Microbiological Criteria for Foods. HACCP has been endorsed by components of the World Health Organization, suggesting, in the words of Dr. Bauman, "that some day the world food industry may be playing with the same deck of cards."

In the United States, three other government agencies are taking preliminary steps toward extending HACCP to meat/poultry and seafood inspection operations (*see following page*).

Today, Pillsbury plants are still operating under HACCP and their managers are delighted with the results. Says Pillsbury: "There have been more than 130 food safety-related recalls of product from the marketplace from 1983 to 1991. None were Pillsbury products. HACCP works!"

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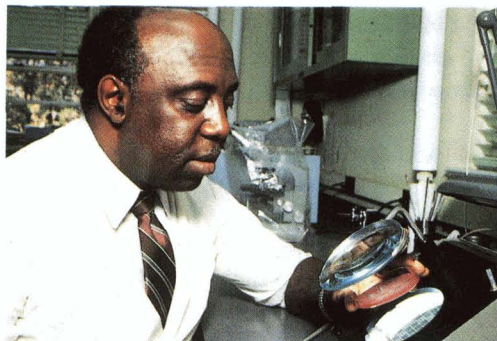


Above and at left is a sampling of Pillsbury consumer products manufactured under the spinoff system of food processing control that ensures maximum food safety.



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A Dividend in Food Safety (Continued)



meat and poultry products. It is, says FSIS Assistant Administrator Dr. Catherine E. Adams, "the most intensive food inspection system in the world." Nonetheless, FSIS is engaged in a major effort to improve it. Dr. Adams elaborates:

"It is the industry's job to produce safe, wholesome, accurately labeled meat and poultry products. It is the agency's job to see that industry does its job well and consistently.

"We are committed to the continuous improvement of our inspection program to better protect public health. We believe the inspection job can best be done by *preventing* potential problems from occurring — including microbial and chemical contamination. The FSIS is convinced the Hazard Analysis and Critical Control Point (HACCP) system will serve as the best mechanism for preventing unsafe and unwholesome product."

Following up on recommendations from the National Academy of

The U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS), the public health agency responsible for inspecting meat and poultry, each year inspects more than 120 million head of livestock, six billion birds, and billions of pounds of

Sciences and the National Advisory Committee on Microbiological Criteria for Foods, FSIS is conducting a study to determine the best way to incorporate HACCP into the meat and poultry inspection program. Dr. Adams is executive director of the HACCP project; Dr. Wallace Leary, a 20-year FSIS employee, heads a HACCP Special Team that is conducting workshops, pilot plant tests and evaluations. Says Dr. Leary:

"The HACCP study will allow us — and industry — to develop and test model HACCP plans for specific products and processes. We'll then test the HACCP plans in volunteer plants, working with our in-plant employees. The process will allow us to see how HACCP works under realistic conditions."

Dr. Leary believes that HACCP will permit inspection personnel to do an even better job of protecting public health. The focus of inspection will



The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture is conducting an extensive study to determine how the spinoff Hazard Analysis and Critical Control Point concept can best be incorporated into the FSIS meat and poultry inspection program. The photos illustrate some FSIS inspection and test operations. Top left, a microbiologist is observing bacteria on a blood sample plate; above, a food inspector is checking the internal temperature of sausages to ensure the product is safe to eat; at right, a veterinarian at a hog slaughter plant screens hog carcasses for contamination; at top right is a closeup of a "quick test" that shows whether roast beef has been sufficiently cooked to destroy disease-producing bacteria, such as salmonella.

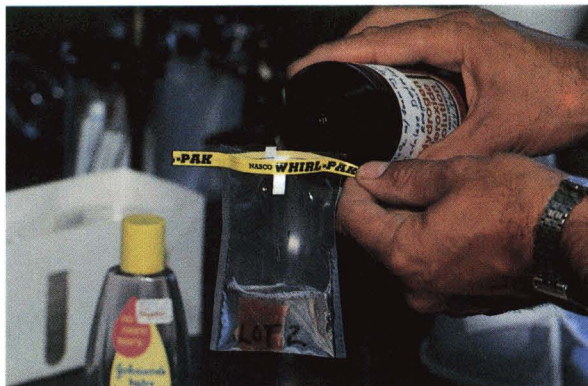
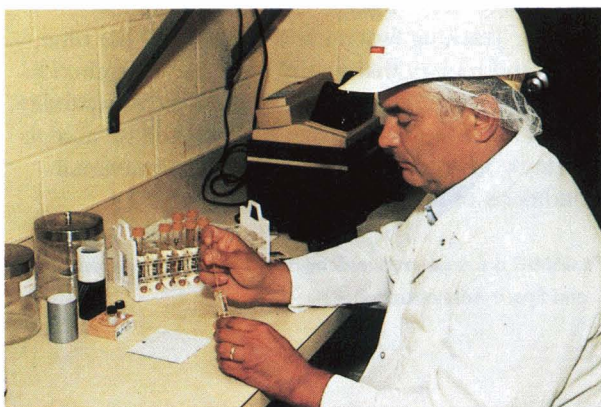
change, with less emphasis on the final product and greater attention to the safety steps along the way where contamination could occur. To explain HACCP, he cites an example: production of cooked turkey breast that is vacuum packaged and then pasteurized.

"The first step is to identify the Critical Control Points (CCPs), or those steps in the process that could result in an unsafe product if not properly followed. In this example, CCPs could include cooking, chilling, rehydrating, pasteurization, chilling again, and storing. Once you've determined the CCPs, you then set the criteria that must be met for each one, as well as the monitoring and verification methods.

"In our example, according to current regulations, the cooking CCP would require the turkey to be cooked to a 160 degree Fahrenheit internal temperature. Plant personnel would be required to check and record the cooking temperature regularly; the inspector would check the plant's records for authenticity and accuracy, verify that the thermometer measured the temperature accurately, and periodically double-check the internal temperature of the product.

"This example illustrates the simplicity of HACCP, but when the CCPs are determined, monitored and verified on an ongoing basis, you have a sophisticated process control system with little chance of manufacturing an unsafe or otherwise contaminated product."

The FSIS study began at the end of 1989. Initial steps in 1990 included public hearings and consultations with consumer groups, industry and FSIS employees to get their input. A series of workshops with food industry technical experts got under way in February 1991. FSIS expects to complete in-plant tests and evaluation in 1993.



In another government program, the Food and Drug Administration (FDA) and the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration are planning a HACCP-based voluntary inspection service for seafood.

Seafood is regulated at the federal level primarily by the FDA. NOAA Fisheries operates a voluntary fee-for-service seafood inspection program. The two agencies cooperate under an agreement whereby NOAA Fisheries ensures that clients' operations and products meet FDA requirements as well as NOAA Fisheries' own quality and identity requirements.

The new Voluntary Fish and Fishery Products Program will generally follow the HACCP approach, expanded to include economic and sanitation parameters. It will emphasize the industry's role in continuous problem prevention/problem solving, from "water to the table," rather than reliance on periodic government inspection and product sample analyses.

The program involves substantial self-monitoring of CCPs by participating firms. To assure its effectiveness, there will be regular fee-for-service monitoring inspections and less frequent verification inspections by FDA and NOAA Fisheries. These inspections will enable the agencies to determine whether each HACCP-based system is in compliance with a plant's HACCP plan.

FDA and NOAA Fisheries expect the joint program to lead to more efficient regulation of the seafood industry and provide further assurance of food safety, wholesomeness and truthful labeling. It will also provide recognition to firms operating successfully under HACCP in the form of a government mark, or seal, that indicates the product comes from a facility that is meeting program requirements.